

STANDARD SPECIFICATION FOR M. V. SWITCHGEAR

1.0 INTENT

This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, packing, transportation, receipt at site, installation, testing and commissioning of medium voltage switchgear comprising of Power Control Centres (PCC), Motor Control Centres (MCC), Power-cum-Motor Control Centres (PMCC) etc. and complete with all materials and accessories for efficient and trouble-free operation.

2.0 CODES & STANDARDS

2.1 The design, manufacture and performance of equipment shall comply with all currently applicable Indian Standards, I.E. rules, statutory regulations and safety codes.

2.2 Unless otherwise specified, equipment shall conform to the latest applicable Indian Standards and in particular the following:

i	IS-772 (part-1) (2nd rev.)	:	AC electricity meters - general requirements.
i	IS-1248 (1st rev.)	:	Direct acting electrical indicating instruments
i			
i	IS-2705	:	Current transformers.
v			
v	IS-3156	:	Voltage transformers.
v			
v	IS-3231	:	Electrical relays for power systems protection.
i			
v	IS-3618	:	Phosphate treatment of iron & steel for protection against corrosion.
i			
i			
v	IS-5082	:	Material data for aluminium bus bars.
i			
i			
i			
i	IS-5578	:	Guide for making of insulated conductor.
x			
x	IS-6005	:	Code of practice of phosphating of iron & steel.
x	IS-8623	:	Factory built assemblies of switchgear & control gear for voltages up to and including 1000V AC and 1200V DC; particular requirements for bus-bar trunking systems.
i			
x	IS-11353	:	Guide for uniform system marking &

i			identification of conductors and
i			apparatus terminals.
x	IS - 13235	:	Calculation of the effects of Short-
i			Circuit Currents
i			
i			
x	IS-13703	:	Low voltage fuses.
i			
v			
x	IS-13947	:	LV switchgear and control gear.
v	(part 1 to		
	part 5)		

3.0 GENERAL REQUIREMENTS

3.1 Detailed description of the PMCC panels:

A. General Description of Panel:

- a) Panel shall be **single front**, extensible type, sheet steel clad, self-supporting and floor mounted with integral base channel, cubicle type, indoor, dust and vermin protected. It shall contain copper bus bars (both horizontal main and vertical feeder) and individual motor starter/feeder panels suitable for operation from front side. Frames shall be made from suitably sized rigid framework of steel formed angles and channels and 2 mm thick CRCA sheet steel. Cubicles shall have individual front doors with sturdy hinges and fitted with special non-deteriorating neoprene gasket. Lifting lugs shall be provided on the top of panel.
- b) Panel including busbar shall be suitable for future horizontal expansion on both sides. Busbars and cubicles/side walls of the panel shall be manufactured accordingly.
- c) Panel shall have horizontal main busbars(of ratings as given for individual panel details in the Annexure- Panel Feeder Lists) with alternate vertical busbar and cable alleys for proper distribution of panels.
- d) A 50 x 6mm GI strip should be provided on the backside of the panel with adequate holes (13mm dia each) with nuts, bolts and washers for making earth connections for all panels and cables. Length of GI strip shall be same as panel length. Zinc plated and passivated double earthing studs with nuts, bolts and washers shall be provided on the earthing strips.
- e) The PMCC panel shall be thoroughly cleaned and chemically pre-treated for rust/grease removal and phosphate coating in a **minimum seven tank** chemical treatment process. After chemical treatment, the panel shall be powder coated/**polished** with epoxy resin based powder and stoved in a stoving oven. Coating (dry film) thickness shall be 50 micron minimum as per IS: 13871-2006. Finish shall be glossy.

- f) Colour of the PMCC panel shall be light grey to IS: 5 of 2007.
- g) The complete PMCC panel shall be based on a 75x40x6 mm channel with suitable grouting arrangement.
- h) Danger plates (415 VAC) shall be fixed on both front and rear of panel including the busbar chambers.
- i) Panels shall be suitable for bottom entry of cables.
- j) Automatic safety shutters shall be provided to ensure the inaccessibility of all live parts after the breaker is drawn out. It shall not be possible to draw out the carriage or rack it in with circuit breaker closed. The breaker /contactor feeder trolley shall remain inside the cubicle even in the test position.
- k) Panel and its components shall be conforming to IS: 8623, 8828, 13947 and 12640 & IEC: 60947 & 60439-1. Protection shall be as per IP-54. Ambient-40°C (Max)/ 5°C (Min), Humidity-95% (Max).
- l) All components used must be suitable for the environment as mentioned. All hardware should be of high tensile steel & galvanised/ Zinc passivated. Size of spring washers & flat washers should be as per relevant IS for individual bolt.
- m) Suitable lifting hooks shall be provided on each panel or shipping section.

Panel can also be of modular design, with plug-in/withdrawable type switchgear panel. In case of modular panels, the matching parts (male/female) in both power and control circuit shall be of high accuracy and quality for perfect insertion. The plug-in panels must be designed for easy insertion and withdrawal. Component layout shall be designed for maximum heat dissipation. Cable alleys shall be provided for incoming and outgoing cables with labeled terminal blocks and fixing arrangement of cables.

Limiting dimensions of the PMCC panel are 6000 mm (width) x 700 mm (depth/thickness) x 2300 mm (height). Minimum working height shall be 300 mm. However, minor deviation regarding size can be accepted after discussion with OIL.

B. Detail Description of Panel

All the panels shall have the same specifications except the no. of feeders/starters in each and hence size. The nos. of feeders and starters for each of the panels including the incomers (suitable for the designated installations) are given in the Annexure- Panel Feeder Lists).

System basic design data:

Rated Service Voltage- 690 V


Rated operational voltage- 415 V

Max- Min. ambient temp- 40/5 deg. Celcius

Humidity- 98% Max.

Altitude- 100 m above MSL

a) Incomers:

 <p>ऑयल इंडिया लिमिटेड Oil India Limited Conquering Newer Horizons</p>	Construction of GCS at Makum	DOCUMENT NO: GCS-ELE-004
	Specification of Medium Voltage Switchgear	Sheet 4 of 17

There will be 2 (two) incomers, with 690V (Ue), 800V (Ui), 50 kA Icu (ICu=Ics) or above breaking capacity rated three pole withdrawable type air circuit breaker or plug-in type moulded case circuit breaker, electronic/microprocessor controlled with LSIG protection with adjustable settings [long delay (0.4-1.0 In)/short delay (1.5-10 long delay setting)/Instantaneous (1- 10 x In & OFF)/ground fault (0.1-1.0 In) with individual time settings] with separate earth leakage module. Incomer minimum rating will be 630 A. Incomers above 630 A will be air circuit breaker, rated 1000 A. Earth leakage module shall have range of 0.03-3.0 Amps and 0- 3 seconds, both current and time in adjustable steps. The earth leakage protective device may either be in-built earth leakage trip module (in case of ACB and larger MCCBs), a CBCT + EL module combination (for MCCBs) or a separate, but MCCB mountable EL module. The ACBs/MCCBs shall conform to IEC 60947/IS 13947-2, tropicalized to Class-II (high humidity).

Make: Schneider/Legrand/Siemens/L & T/ABB /Indo-Asian / C&S.

Ratings of the incomer panel ACBs/MCCBs are as given in the Annexure-Panel Feeder Lists.

All incoming and outgoing terminals of ACBs/MCCBs shall be fitted with bus links or spreader links supplied by ACB/MCCB manufacturer or brought out phase links of copper in rectangular sections with holes. Zinc passivated nut bolts with flat and spring washers for connection shall be provided for cable termination (2 or 3nos. of 3.5x240 sq mm LT PVCA copper cable for incoming supply for each incomer, depending on incomer current rating). The links shall be supported on non-hygroscopic insulating bars of FRP/DMC based materials and shall be of suitable size for cable termination. The vertical distance between the centre of connection hole in the links for cable connection and the bottom gland plate shall be minimum 450 mm. Detachable gland plate shall be provided which shall be suitable for fixing two/three nos. of cable glands of the size mentioned.

Metering/ Instrumentation for the Incomer (two sets, one set for each incomer):

- 1) 01 no.- Digital multifunction meter indicating Voltage, Current, Frequency, Power factor, Power and Energy with RS-485 capability; make- Swift-Encore/Siemens/HPL-Socomec/Merlin Gerin (Schneider). The multi-function meter shall also have function for maximum demand (maximum demand indicator).
- 2) 03 nos.- Current transformers, wire wound, 1000/5, 15 VA, Class 1 to IS: 2705; make- AE/Kappa/Siemens
- 3) 08 nos.- LED indication lamps for indication of 'Supply ON' (for R/Y/B phases), 'CB Off/CB On/Trip-OC/Trip-SC/Trip-EF'; make- Teknik/Siemens/Schneider/ABB
- 4) As required- MCBs for control circuit and instrument circuit protection; 'C' curve. Make-Schneider/Legrand/ABB/Indo-Asian

b) Busbars and bus chamber:

Bus chamber shall be steel clad having front and rear bolted covers. The busbars shall consist of 1 set of hard drawn, high conductivity, three phase,

electrolytic grade, virgin copper bars of purity 99.99% or better, rated minimum 1000/1250 Amps, supported at sufficient intervals on non-hygroscopic, non-inflammable glass reinforced plastic (GRP)/sheet moulding compound (SMC) supports. Busbars shall be rated to withstand short circuit fault currents of 50 KA for 1 second. The busbar individual phases shall be colour coded for easy identification. Main busbars shall be full length of the panel. Vertical bus bars for feeding individual starter/feeder shall be full height of the panel. Sufficient clearance shall be maintained in the bus chamber for proper cooling of the busbar. Busbar should be extensible type to facilitate future extension.

c) Starter/Feeder Panels:

No. and ratings of Starters/feeders will be as per individual panel outgoing details, given in Annexure- Panel Feeder Lists. However general description for these shall be as follows.

Description of Starter/feeder panels:

1) MCCB isolator (Isolation requirement):

Each feeder/motor starter cubicle shall be provided with one no. 690 V(Ue), 800V(Ui), min. 36 kA breaking capacity, three pole MCCB fitted with inbuilt microprocessor controlled long time, short time, instantaneous, ground fault (LSIg) and earth leakage releases with adjustable settings for current & time and with Rotary Handle operating mechanism. For feeder panels also, three pole MCCBs shall be used with identical capacity and type.

The MCCBs shall be operated from outside the panel. The MCCB handles shall also project outside the panel doors enabling breaker operation from outside the panel. All MCCB used shall be suitable for positive isolation requirement as per IEC 60947-2. Control supply of individual starters shall be tapped from its own line; the starter shall be in-operative if the MCCB is off. However remote start/stop pushbutton supply shall be from 30 V phase-to-phase (maximum) auxiliary bus.

2) Panel components:

Various starters and feeders shall be housed in individual cubicles. Components shall be mounted on sheet steel base and all apparatus shall be suitable for front removal. All starters/feeders shall have suitably rated MCCBs as incomers. For feeder/starters above and including 20 HP, MCCB incomer connection to busbars shall be through suitably rated copper bus links/spreader bars only. This is to avoid mechanical stresses that may develop during short circuit condition.

Motor starters above and including 12.5 HP shall be star-delta starters (except soft starters). Starters below 12.5 HP shall be DOL starting.

Earth leakage module shall have range of 0.03-3.0 Amps and 0- 3 seconds, both current and time in adjustable steps. The earth leakage protective device may either be in-built earth leakage trip module (in case of ACB and larger MCCBs), a CBCT + EL module combination (for MCCBs) or a separate, but MCCB mountable EL module.

Starter panel components like MCCBs, contactors, overload relays, RCBOs etc. shall conform to IEC60947-2/IS: 13947-2 and IS: 12640. All starter/feeders shall be provided with Type II protection.

Space Heaters:

The panels shall be provided with space heaters to prevent moisture condensation. The space heater with porcelain connectors shall be located at the bottom of each panel and shall be supplied from 240 V A.C. aux. bus for space heater. The space shall be provided with a manually operated switch (MCB) and HRC fuse and link for phase and neutral respectively with thermostat regulator. The space heaters shall be located at the bottom of the switchboards.

The control voltage of remote push button stations for motors is to be limited to maximum 30 V as per CEA Regulations, 2010. An intrinsically safe barrier shall be placed between the remote pushbutton station and motor starter panel, so that no dangerous voltage (for hazardous area) is transmitted for operation of the remote pushbutton station. The intrinsically safe barrier may be placed in the motor starter panel.

Low voltage power supply to panel contactors and intrinsically safe barrier power requirement may be generated through two nos. step down transformers placed at both ends of the panel. The low voltage secondary side of the transformers shall be connected to an auxiliary bus. Control voltage shall be tapped to individual motor starter/feeder panels from the auxiliary bus through auxiliary control MCBs in each starter/feeder panel.

[As supply source (captive gensets) shall be installed with NGRs, the neutral cannot be used anywhere in the system. Hence all control voltages will be referred to phase-phase only.]

Control voltage transformers shall have individual MCBs of sufficient ratings as breakers in both primary and secondary sides (individual for each transformer). Each of the transformers shall be able to take the entire control voltage load of the panel. One of the transformers shall be on line and the other shall be standby.

Main components of individual starter/feeder panels (other than main incomers):

Starter panel components (including soft starter panels)	Feeder panel components
<ul style="list-style-type: none"> • Incomer MCCB • EL detection module/CBCT+ELCB combination • Magnetic contactor (for DOL or SD starters) • Soft starter (only for soft starter panels) • Starting and Bypass contactors (only for soft starter panels) 	<ul style="list-style-type: none"> • Incomer MCCB • EL detection module/CBCT+ELCB combination • LED indication lamps for feeder on/off/trip status

- Thermal overload relay
- Low voltage (maximum 30 V) supply for remote push button system, including all accessories
- Remote/local selector switch
- Local on/off (start/stop) pushbuttons
- Intrinsic safety barrier for the remote control system
- Ammeter (digital)
- CT, where required
- Control voltage transformers
- Control MCBs
- LED indication lamps for on/off/trip status

- Incomer MCCB (as isolator/main switch)
- Earth leakage module in the downstream of MCCB (integral to MCCB, or through separate CBCT & earth leakage relay or directly mountable on the MCCB (as an add-on block) with variable current and time settings (0.03- 3.0 A and 0-3 second, in steps)
- For starter panels only- Motor Starter magnetic contactor/s and adjustable thermal overload relay
- Soft starter panels- Individual soft starter cubicles shall have individual soft starter units. Other components such as cubicle incomer MCCB, earth leakage protection with the MCCB, main (starting) contactor, running contactor, thermal overload relay, remote/local selector switch, start/stop pushbuttons, LED indications, intrinsically safe barriers etc. shall be as in the normal star/delta or DOL starter panels.
- Timer for star delta starter, range 0-60 seconds, adjustable in steps/continuous
- Remote/ local selector switch- for facilitating remote/local starting of motor
- Local start/stop switch- for starting/stopping of motor from panel
- Low voltage (maximum 30 V) supply system for remote pushbutton station, along with intrinsically safe barrier for isolating hazardous areas and non-hazardous areas (safe area), i. e., in the panel. Intrinsically safe isolators/barriers shall be in the panel.**
- For starter panels only- Ammeter (accuracy class 1.0), directly mounted for starters below 10 HP and through CT for and above 10 HP.
- 'On', 'Off' and 'Overload' LED type indicating lamps

Make/models of the components:

Only the following makes/models of the components shall be used in the starter/feeder panels.

Name of component	Make Model Rating
Main panel incomer ACB with minimum LSIg Protection (1000	EDO type, fault level 50 kA or above at 500 VAC. Electrically and manually operated with O/c, S/c, instantaneous and

A) (where ACB as incomer is mentioned)	earth fault protection. Spring charging shall be motorized with 230 Vac as well as manual. Make: Schneider Masterpact NW series with Micrologic 6.0A or better /Siemens WL series with ETU GT-N/GT-H/ABB- EMax series with ETU PR 121/122 / Legrand- DMX3-N with ETU cat no. 028802 MP4 LSlg or MP6LSlg / C&S equivalent model with LSIG Protection.
Main panel incomer MCCB with minimum LSlg Protection (say for 630 A range) (where MCCB as incomer is mentioned)	Schneider Electric (Compact NSX with Micrologic 6.0 and above)/ Legrand (Model DPX/DPX3 range with electronic LSlg release-Sg type)/ Siemens (Sentron VL with ETU 45 LSlg) /ABB (Tmax T6 with PR 222)/Indo-Asian (X TEC series with X5/X6 LSlg release) / C&S equivalent model with LSIG Protection.
Digital multifunction meter	Swift-Encore (Swift Encore SW3)/ Siemens (PAC 3100)/ HPL-Socomec (Diris A40)/Schneider (EM 6400 accuracy 0.5)
Incomer MCCB (for individual cubicles) with LSlg Protection	Schneider Electric(Compact NSX range) /Legrand (DPX3 range)/Siemens (Sentron 3VT series)/ ABB (Tmax series)/Indo-Asian (X-TEC series) / C&S
RCBO	Schneider Electric/Legrand/Siemens/GIC
CBCT+ELCB combination	Schneider Electric (RH 197P+GA300 etc.)/ Legrand (0260 88+ 0260xx series)/GIC
Magnetic contactor (for DOL or SD starters)	Schneider Electric (TeSys series)/Siemens (3RT series)/ ABB (AXX series) /C&S
Soft starter	ABB/Siemens/Schneider
Starting and Bypass contactors (only for soft starter panels)	Schneider Electric/Siemens/ABB
Thermal overload relay	Schneider Electric/Siemens/ABB / C&S
Timer	Schneider/Siemens/ABB/Indo-Asian
Remote/local selector switch	Siemens/L&T/Kaycee/Teknik/ABB
Local on/off (start/stop) PBS	Kaycee/L&T/Recom
Intrinsic safety barrier for the remote control system	Omega/R-Stahl/ MTL/ Pepperl+Fuchs
Ammeter (digital)	AE/Rishabh/L & T/Schneider
Control supply transformer	AE/Kappa/Siemens/reputed make

CT, where required	AE/Kappa/Siemens	Wire wound, 1000/5, 15 VA, Class 1 to IS: 2705
LED indication lamps for on/off/trip status	L&T/BCH/ Teknik/Siemens/ Schneider/ ABB/Binay	As per voltage rating, all with LVGP
Control MCBs	Schneider/Legrand/ABB/ Siemens/Indo-Asian	'C' Curve

Important points to be considered while designing the starter/feeder panels:

i) *****As the panel will be installed in an oil/gas mine, as per Central Electricity Authority Regulations 2010, the remote starting facility of starter panels for motors shall be suitable for voltage below 30 Volt and intrinsically safe.***

The control voltage of remote push button stations for motors is to be limited to maximum 30 V as per CEA Regulations, 2010. An intrinsically safe barrier shall be placed between the remote pushbutton station and motor starter panel, so that no dangerous voltage (for hazardous area) is transmitted for operation of the remote pushbutton station. The intrinsically safe barrier may be placed in the motor starter panel itself.

ii) Low voltage power supply to panel contactors and intrinsically safe barrier power requirement may be generated through two nos. step down transformers placed at both ends of the panel. The low voltage secondary side of the transformers shall be connected to an auxiliary bus. Control voltage shall be tapped to individual motor starter/feeder panels from the auxiliary bus through auxiliary control MCBs in each starter/feeder panel.

iii) All ACBs & MCCBs shall have provision for padlocking and shall be provided with suitable locks with two keys for each lock.

iv) MCCBs, contactors, overload relays shall be of one make only. However, earth leakage relays, CBCT etc. may be of different make than contactors/OLR etc. CBCT and sensing earth leakage relay shall be compatible and from the same manufacturer.

v) One rating of components shall be used for a range of starters (e.g., one rating of contactors in all starters up to 20 HP, but suitable range of overload relay to match the panel rating). All device selection shall take motor starting current into consideration.

vi) For hazardous areas, 3 phase 3 wire connection shall be used including lighting loads (through lighting transformer). However, in case 3 phase, 4 wire supply (for neutral) is required, power from the 3 pole feeder will be supplied through isolation transformer (415 V/415 V, delta/star-neutral) only. Two nos. of such feeders (capacity 30 KVA each, one running and one standby) shall be accommodated in each PMCC panel. [Isolation transformer is not in the scope of supply.]

vii) Outgoing cables/bus links from the individual panels shall be terminated in individual TBs mounted in cable alleys. TBs will be sufficiently rated. Separate

control and power TBs are to be used. TBs shall be covered/separated with insulation barriers.

viii) 1 (one) cubicle box with three phase 63 A RCBO as incomer and 12 nos. DP MCBs (suitably rated) for illumination and power socket outlets for the panel installation area shall also be separately provided. This cubicle box will be a stand-alone type panel. Incoming power to the cubicle will be from lighting transformer, as the lighting for the entire installation will be phase to phase 240 V and will be supplied from the lighting transformers. One such cubicle is to be supplied with each panel. The cubicle box shall be suitable for floor mounting on a sturdy MS frame.

3) Panel wiring:

i) All internal wiring and cabling inside the MCC starter panels shall be done with 1.1 KV grade fire retardant PVC insulated tinned copper multi-stranded flexible cables with proper lugs. All wires and cable shall have proper ferrule numbers for easy identification.

ii) Ring lugs shall be used at all critical connections such as CT connections. No more than two wires or lugs may be attached under any one screw. All control & CT wiring should be terminated on suitable TBs. All terminal strips to have minimum 2 nos. spare terminals to accommodate any modification required during commissioning / operation. All terminal strips shall be accessible for testing and troubleshooting/maintenance.

iii) All control wiring inside the panels shall be done with single core, fire retardant multi-stranded flexible copper PVC insulated (1100 V) wire, 1.5 mm² for potential circuits and 2.5 mm² for current circuits. Control wires shall be properly identified with ferrule numbers and suitably terminated with proper sized lugs; cable make- Finolex/Havells/Henley/Nicco/Reputed brand.

4) Features of the Panel:

i) Thickness of gland plates shall be minimum 3.0 mm.

ii) The panel doors shall have door latches suitable for latching in one turn only. Lifting hooks shall be provided.

iii) Special non-deteriorating Neoprene rubber gaskets shall be used in doors and as and where required.

iv) All MCCB Operating handles shall be accessible for operation without opening the cubicle door. The handles will be interlocked with doors, i.e., unless MCCB is in OFF position, door cannot be opened.

v) Adequate insulated barriers between the bus chamber and feeder shall be provided to achieve Form-2 separation as per IEC 439-1.

vi) MCCB incoming terminals are to be provided with insulating barrier so that once the door is opened, no live part is exposed.

vii) Vertical cable alleys with sturdy supports for carrying weight of vertically run PVCA cables will be placed next to the panels. The cable alleys will house sufficiently rated TBs. The cable alleys and vertical busbars shall be on either side of the panels.

viii) All connection links between busbar and MCCB incoming side and from outgoing side to the cable alley TBs (for feeders/starters above and including 20 HP) shall be made with rectangular section of copper bus links conforming to IS. Current rating of links shall be minimum 1.5 times (rating for

unassembled sections) the switch rating. All joints shall be checked for proper contact area.

ix) Wiring cables from panel to door shall be protected with heavy duty PVC spiral binding.

x) All the hardware should be of high tensile steel duly zinc passivated for corrosion protection & fitted with proper sized heavy duty spring washer & two nos. heavy duty flat washers.

xi) Sufficient space should be provided for proper glanding, dressing, connecting up and maintenance of cables. Adequate space should be provided for connecting the cable leads to the terminal blocks.

xii) Suitable cable supporting arrangement shall be provided inside the cable alleys to firmly grip the cables connected to the terminal blocks of the outgoing feeders.

xiii) All hinged doors shall be earthed with copper flexible loops / braids as per IS-3043.

xiv) A 50 x 6mm GI strip shall be provided with adequate holes (13mm dia each) with nut, bolts and washers for making earth connections for all panels and armours/screens of cables. Length of GI strip shall be same as panel length. The panel GI strap shall have provision with fasteners for connection to external earth electrodes with suitably sized GI strap.

xv) Panel length should be limited to 4.0 mtr. Height shall be suitable for operation of feeders as per ISI.

xvi) Suitable SS/brass material, NiCd plated single compression cable glands shall be provided in the panels. Gland sizes shall be provided by OIL during detailed engineering/drawing approval. Gland plates (3 mm thick) with suitable size knockouts shall be provided.

Important: All MCCBs shall be mounted vertically. Suitable bus links/spreader bars to incoming/outgoing sides of MCCBs shall be provided as and where required.

C. Drawings and Documents:

1. The following documents are required to be submitted with the Bid.

(i) Confirmation that the offered panels shall conform to all the points of the tender. Any deviation from the tender specs must be clearly mentioned with technical justifications. In case of an order on the party complete tender specs and the deviations accepted by OIL in writing shall only be mentioned in the order.

(ii) Copy of test certificate for busbar rated 1000 Amps or above for fault level of 50kA for 1 second from CPRI or any govt. approved NABL accredited test laboratory.

(iii) Copy of test certificate for busbar rated 1000 Amps or above for temperature rise from CPRI or any govt. approved NABL accredited test laboratory.

(iv) Copy of test certificate for panels with Degree of Protection IP: 54 from CPRI or any govt. approved NABL accredited test laboratory

(v) Indicative general arrangement and layout drawing of the panel

(vi) Indicative schematic and single line diagram of the panel

(vii) Quality Management Certification ISO: 9001 # 2008 version for Design, manufacture, installation and servicing of medium voltage Electrical control and distribution panels.

(viii) Credentials of Vendor having minimum 05 (five) years (till the bid closing date) experience in design, fabrication and testing of LT PMCC Electrical Panels. During these years Vendor must have manufactured and supplied minimum 5 nos. of panels to Govt./semi-govt./PSUs/Public limited companies. These panels must be in operation satisfactorily as on date.

(ix) Credentials of Vendor having minimum seven tank anti rust treatment system and powder coating facility for treatment and painting of sheet metal works for durability. Tank sequence: degreasing, water rinse, de-rusting, water rinse, activation, phosphating, water rinse, passivation.

(x) Indicative bill of materials with offered spares list and prices of spares

(xi) Filled up technical check list

(xii) General Quality Assurance Plan of the manufacturing process of the OEM

2. Detail foundation drawing, drawing of panel showing termination details, full wiring diagram, component layout diagram and complete bill of material must be submitted to OIL for approval within 30 days after placement of the order. OIL shall modify/correct drawings as necessary. The manufacturing of panel shall start only after approval of the drawings by OIL. In the event of an order on the party complete tender specifications and the deviations accepted by OIL in writing only shall be mentioned in the order.

3. Supplier shall also submit detailed ordered panel-specific Quality Assurance Plan for the panels for OIL's approval within 30 days after placement of order. Inspection and testing details of each and every component shall be elaborately given in the QAP.

4. Six spiral bound sets of the following documents, drawings and literatures are to be supplied with the panels, for each panel:

(i) General arrangement, foundation, schematic diagram and wiring diagrams ("**as built**")

(ii) Works Test report containing result of tests done at factory during inspection

(iii) Guarantee Certificate

(iv) Technical Catalogues/manuals of Air circuit breakers, Moulded Case Circuit Breakers, soft starter units, starter components and Digital Meters

(vii) Bill of Materials with part description, part nos. and details of items/components

D. Guarantee:

The LT panel and all parts must be guaranteed with all its components for a period of 12 months after commissioning. Party will arrange for repair/replacement, as required by OIL, of defective parts within one month of reporting of the failure by OIL. This will be at no extra cost to OIL.

E. Testing and Inspection:

Panel shall be duly tested as per IS: 8623 at manufacturer's works and routine test certificate shall be submitted at the time of pre-despatch inspection.

In addition to the routine tests as per IS, OIL representative shall carry out pre-despatch inspection of the panel and witness all necessary testing at manufacturer's works. Vendors shall separately quote charges towards inspection and witness test, if any. [To and fro charges of OIL's personnel to manufacturer's works will be to OIL's account].

Panel shall be tested as per the following details for witness testing by OIL's representative:

- (i) Accuracy of dimensions & circuitry as per approved drawings. Joints of busbar and links shall be checked for proper contact area.
- (ii) Inspection of the assembly including inspection of wiring and mechanical/electrical operation of components and starters/feeders
- (iii) Dielectric (insulation) tests
- (iv) Checking of protective measures and of the electrical continuity of the protective circuit
- (v) Secondary Injection test for Incomer breakers

Any alteration/modification requirements pointed out during the inspection shall be carried out by the manufacturer at no extra cost to OIL and confirmed before dispatch, without which dispatch clearance shall not be given. In case routine test parameters are found to be outside acceptable values, modifications shall be carried out and routine tests on the panel shall again be performed with no extra cost to OIL.

Copies of the test certificates along with bound copies of complete test results (after acceptance) shall be submitted for approval of OIL prior to dispatch of the PMCC.

F. Spares: (Consolidated for all panels)

Vendor shall also include in their scope of supply the operational spares for the panel components with their offer for panels. The quantities of the spares for the panels shall be as follows. The spares will be exact replacement with the full rating, make and model of the units fitted in the panel.

List of minimum indicative spares (total nos., to be supplied with the panels as per OIL approved Bill of Materials):

- a. Main panel Incomer ACB (1000 A)- 01 nos. (01 nos. of operating handles will be provided with ACB)
- b. Main panel Incomer MCCB (630 A)– 02 (two) nos.
- c. All other outgoing feeder/starter panel MCCBs- 02 (two) nos. of each rating (400/250/100 A)
- d. Soft starters- 02 (two) nos. of each rating/capacity
- e. Intrinsic safety barrier for PBS -04 (four) nos. of each rating
- f. Contactors- 04 (four) nos. of each rating/size (for 100 HP soft starters, 40/20 HP SDS & 10/5 HP DOL starters)
- g. Overload relays-04 (four) nos. of each rating/size (- do -)
- h. CBCT- 02 (two) nos. of each rating/size/type

- i. ELR (in conjunction with CBCT) -04 (four) nos. of each rating/size/type
- j. Ammeters and CTs- 02 (two) nos. of each rating and size
- k. Remote local selector switch and local start/stop switch- 02 (two) nos. of each rating/size/type
- l. ON/OFF/OVERLOAD/Other types LED indication lamps with low voltage glow protection- 8 (eight) nos. each colour/type
- m. One set of operating tools required to operate/maintain all the items installed in the panel like box wrench set, screw driver set etc. Standard electrician's tool kits from reputed firms like RS-Components, Stanley etc. are to be supplied.

If felt necessary, Vendor may include further items in the above spares list and quote the prices for these accordingly.

Prices of the spares shall be shown separately and these will be included for price evaluation/comparison of the bids. In the event of an order, final list of spares to be supplied shall be approved by OIL, after drawing approval.

G. General Notes:

1. Material should be adequately packed to avoid damage and ingress of water during transit. OIL's PO no. and date shall be embossed/engraved on the panel.
2. All items of the offered panel must be as per IS/ IEC (with latest amendments).
3. All feeders shall have engraved designation nameplates. Details of Feeder designation shall be provided by OIL at the time of approval of drawing.

Scope of supply:

1. Complete panels with the specifications as mentioned in the detailed specifications
2. Lighting cubicle box (one no. with each panel)
3. Commissioning spares- any left out spares shall be handed over to OIL.
4. Full sets of spares and tools as per OIL's approved list
5. "As-Built" drawings (Schematic and SLD), technical brochures & operation and maintenance manuals of all items, catalogues, test report etc. after final installation and commissioning, 06 (six) copies each.

INSTALLATION & COMMISSIONING:

Scope of Installation and Commissioning:

Supplier shall install and commission the PMCC panel in the designated installations of OIL.

Supplier shall arrange for all manpower, tools and tackles, instruments etc. necessary for installation and commissioning of the PMCC panel.

Jobs:

1. Installation and fixing (including cement grouting) of the supplied panel in the shed (Shed and trench/ foundation shall be constructed by OIL)

2. Connection of the incomer cables (supplied by OIL) to the PMCC incomer breaker (s)
3. Dismantling of the outgoing cables from old panels and connection and jointing (if required) to the new panels, including connection of the new cables if required (supplied by OIL). All cable lugs, terminals, ferrules, heat shrinkable cable jointing kits of proper size shall be supplied by the party.
4. Earthing of the panels as per IS: 3043, with GI straps and earth electrodes (as per OIL specifications)
5. Energization and testing of the panels- in no load condition
6. Testing of the panels in full load condition, including simulation of faults, with available loads
7. Any field modification jobs in the panel including wiring modification jobs
8. Submission of testing and commissioning reports and "As-built" drawings

ITEM NOTES

1. All necessary manpower, tools and tackles, instruments etc. required for commissioning shall be in the scope of the supplier.
2. The following documents shall be submitted with the bid for scrutiny:
 - i. Confirmation that the offered board shall conform to all the points of the tender. Any deviation from the tender specs must be clearly mentioned with technical justifications. In case of an order on the party complete tender specs and the deviations accepted by OIL in writing shall only be mentioned in the order.
 - ii. Copy of test certificate for busbar rated 1000 Amps or above for fault level of 50kA for 1 second from CPRI or any govt. approved NABL accredited test laboratory.
 - iii. Copy of test certificate for busbar rated 1000 Amps or above for temperature rise from CPRI or any govt. approved NABL accredited test laboratory.
 - iv. Copy of test certificate for panels with Degree of Protection IP: 54 from CPRI or any govt. approved NABL accredited test laboratory
 - v. Indicative general arrangement and layout drawing of the panel
 - vi. Indicative schematic and single line diagrams of the panel
 - vii. Credentials of Vendor having minimum 05 (five) years (till the bid closing date) experience in design, fabrication and testing of LT PMCC Electrical Panels with ACBs and MCCBs. During these years Vendor should have manufactured and supplied minimum 5 (five) nos. of panels to Govt./semi-govt./PSUs/public limited companies. These panels must be in operation satisfactorily as on date and credentials shall be submitted for the same.
 - viii. Credentials of Vendor having minimum seven tank anti rust treatment system and powder coating facility for treatment and painting of sheet metal works for durability.
 - ix. Indicative bill of materials with spares list and prices of spares
 - x. Filled up technical check list (Including credentials for supporting BRC evaluation)

In the event of an order, successful Vendor shall submit fresh sets of detailed drawings (as mentioned above) within one month of placement of order which

shall be approved by OIL before actual assembly/ manufacturing of the PMCC panels.

3. Offered panels must be new and in unused condition. No reconstructed/ rebuilt panels will be acceptable.

4. Components used in the PMCC panels shall be of makes (as given in the detailed description) and easily available. Vendor shall submit Bill of Materials (including any additional item to the item list given in the detailed description, if considered essential). Vendor shall also supply all spares essential for installation and commissioning of the PMCC panels at the designated site of OIL.

5. Vendor shall also include in their scope of supply the operational spares for the panel components with their offer for panels. The quantities of the spares for the panels shall be as follows.

The spares will be exact replacement with the full rating, make and model of the units fitted in the panel.

List of minimum indicative spares (total nos., to be supplied with the panels as per OIL approved Bill of Materials): as stated in Para "F" above

6. Vendor shall mention any deviations or other items/ points not indicated /included in the specifications but deemed necessary for design, Installation and commissioning, efficient control and operation of the PMCC panels. However proper justification for deviation must be given.

7. OIL representatives shall carry out pre-despatch inspection of panels and witness all necessary testing at manufacturer's works. Vendors shall separately quote charges towards inspection and witness test, if any. [To and fro charges of OIL's personnel to manufacturer's works will be to OIL's account].

8. Routine Test certificates/reports for the PMCC panels carried out at manufacturer's works as per relevant IS shall be submitted at the time of final inspection by OIL's representative failing which despatch clearance will not be given.

9. PMCC panels shall be guaranteed for 12 (twelve) months from the date of commissioning.

10. Supplier shall submit "As-Built" drawings [6 (six) copies each] for the PMCC panels (after final assembly and commissioning at site) before handing over the same to OIL. In addition, supplier shall also submit technical brochures & operation and maintenance manuals of all items used in the panels.

11. Packing shall be done properly to avoid transit damage and water/ moisture ingress.